It's Not About the Technology

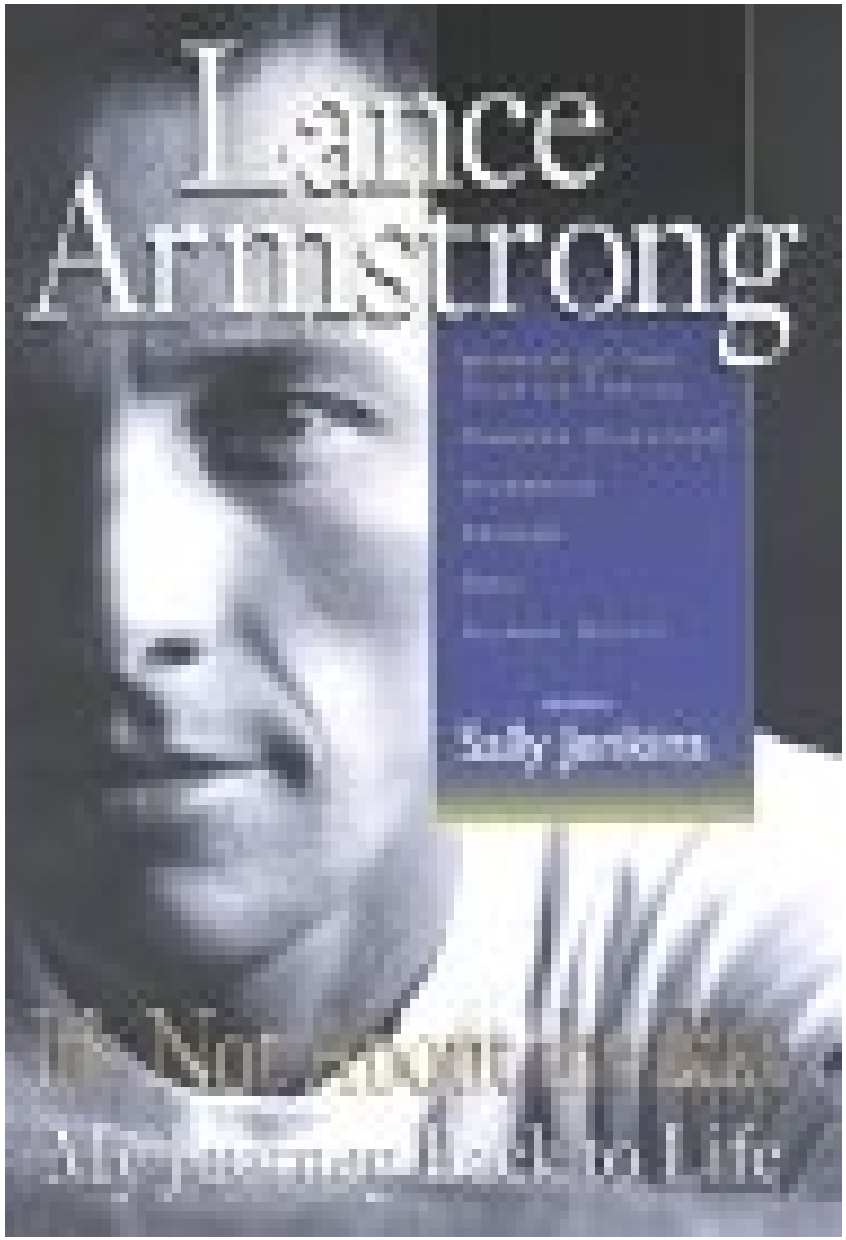
Stephanie Reel

Chief Information Officer

The Johns Hopkins University

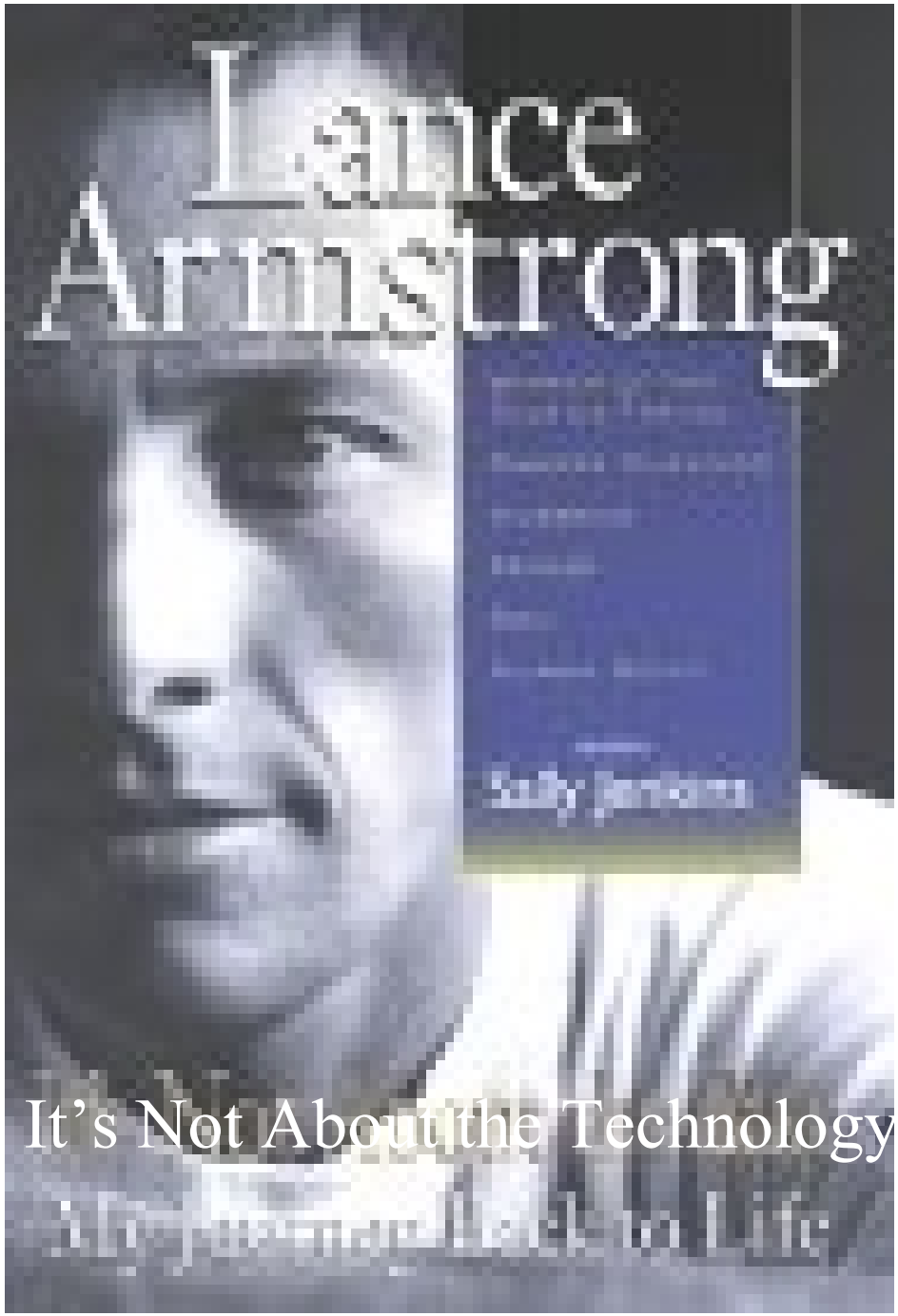
August 23, 2000

Lance Armstrong



It's Not About the Bike

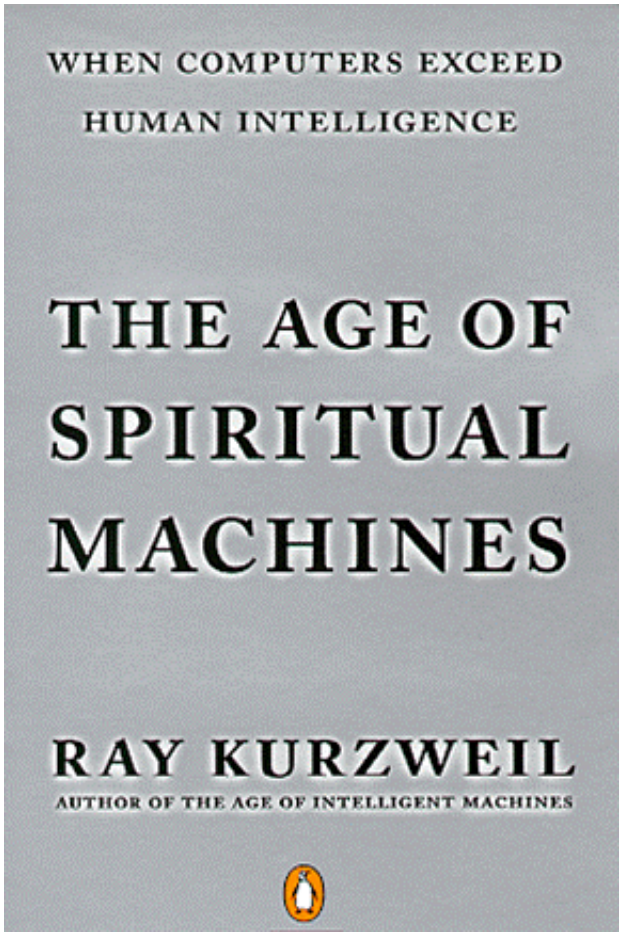
"It's Not About the Technology"



The Future of Technology

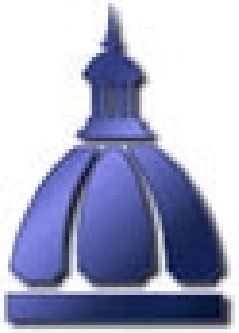
The Age of Spiritual Machines

- Ray Kurzweil



The Future of Technology -2009

Health and Medicine

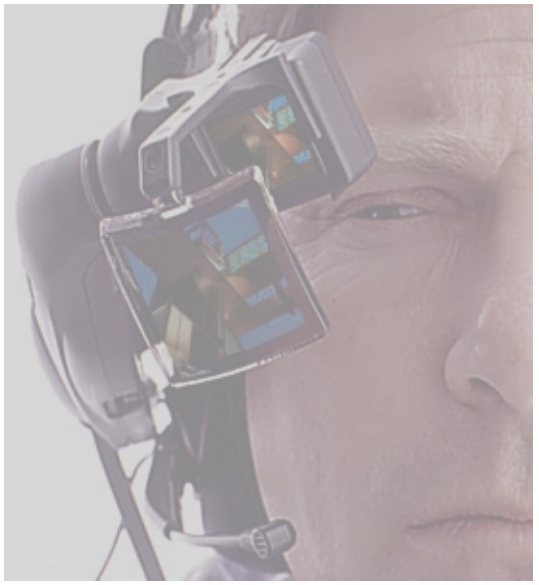


- Bioengineered treatments reducing the toll from cancer and heart disease;
- Telemedicine is widely used;
- Computer-based pattern recognition is routinely used to interpret imaging data and diagnostic procedures;
- Lifetime patient records are maintained in databases;
- Doctors entirely train in virtual reality environments;

The Future of Technology -2019

Computers

- Computers are largely invisible and embedded;
- People use 3-D displays built into glasses or contact lenses;
- Keyboards are rare. Most interaction is through gestures, facial expressions, and spoken communication;
- Nanoengineered machines control their own mobility and have powerful computational abilities;



The Future of Technology -2019

Health and Medicine

- Life processes encoded in human genome are largely understood;
- Expected life span is over 100 years;
- Increasing recognition of the danger of the widespread availability of bioengineering technology;
- Computerized health monitors are built into watches, jewelry and clothing which diagnose health conditions.

The Future is NOW !!!

The Future of Technology -2029

Computers

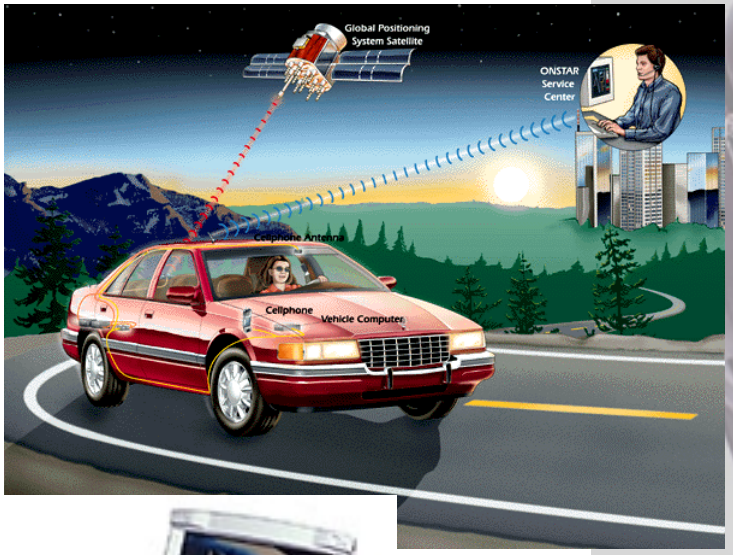
- A $1000 unit of computation (in 1999 dollars) has the computing capacity of 1000 human brains;
- The reverse engineering of the human brain has resulted in machine-based nets which have faster and greater computing and memory capacities;
- Displays are now implanted in the eye, with a choice of permanent or removable implants;
- Microscopic nanoengineered robots now have microbrains with the computing speed and capacity of the human brain.

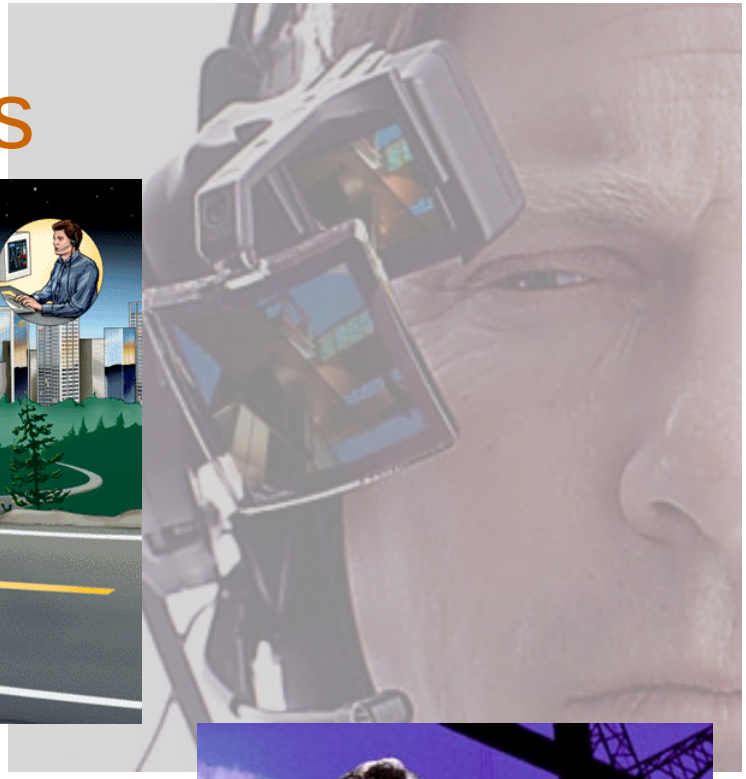
The Future of Technology -2029

Health and Medicine

- Life expectancy grows to around 120 years. Attention is focused on the psychological effects of a longer life span;
- There is growing recognition that extension of human life will involve bionic organs;
- Nanobots (nanoengineered robots) are used as scouts, as repair agents in the bloodstream, and as building blocks for bionic organs.

Emerging Technologies





Information….

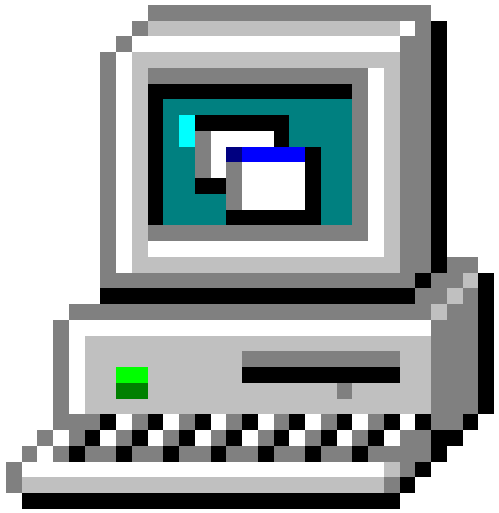
in.for.ma.tion

Pronunciation: "in-f&r-'mA-sh&n

Function: noun

Date: 14th century

The communication or reception of knowledge or intelligence



Technology….

tech.nol.o.gy
Pronunciation: -jE

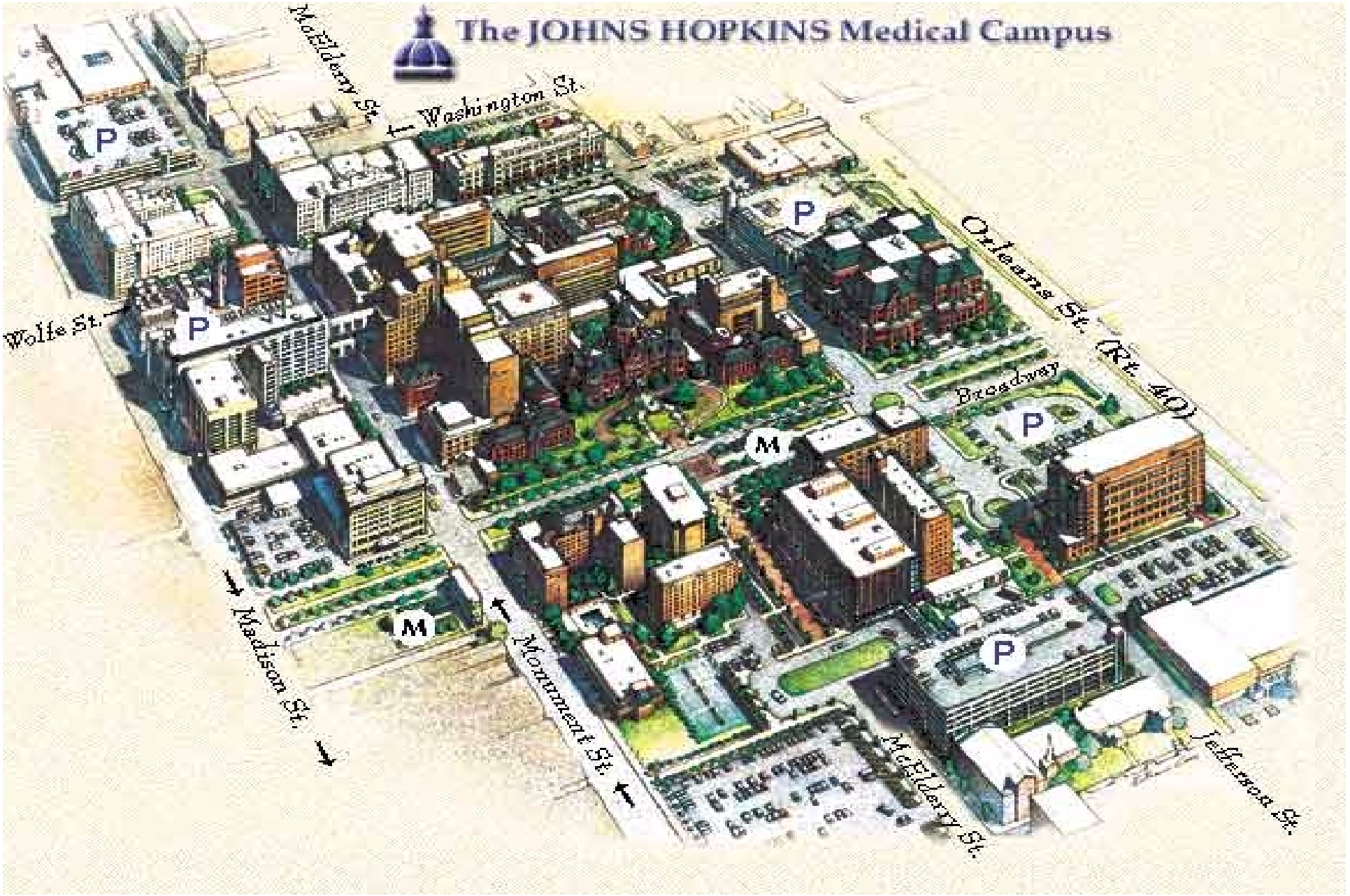
Function: noun Date: 1859

A manner of accomplishing a task especially using technical

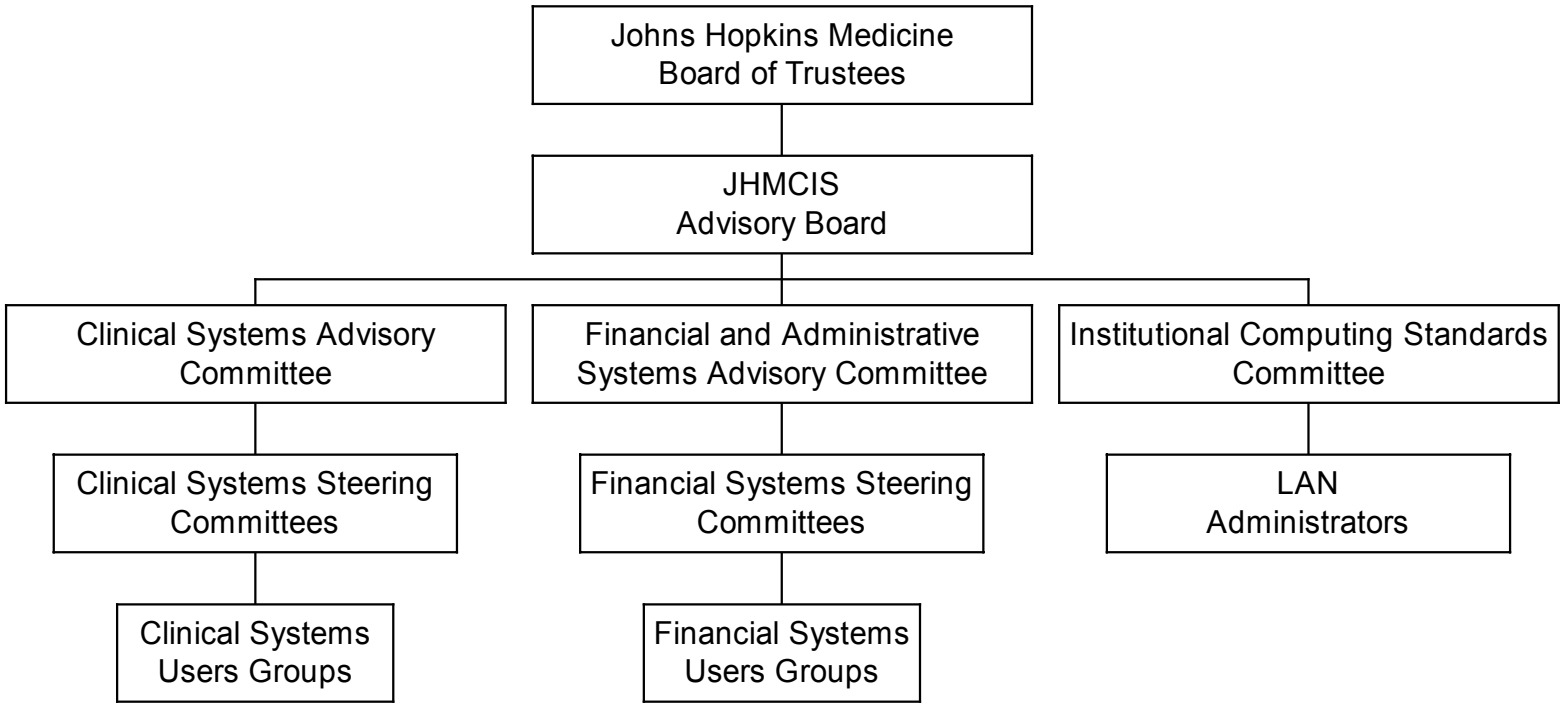
processes, methods, or knowledge

The FUZZY Stuff

East Baltimore Campus

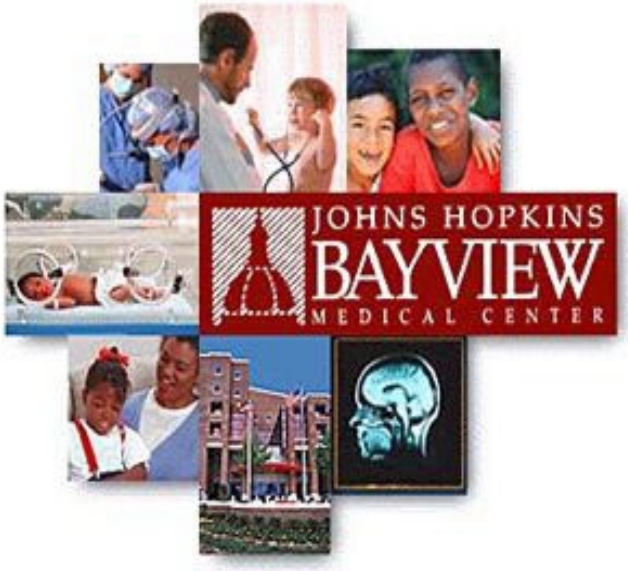


JHMCIS ADVISORY BOARD
REPORTING STRUCTURE



JOHNS HOPKINS MEDICINE

Who are we??



- School of Medicine
- Three Hopkins Hospitals
- Comprehensive Cancer Center
- Statewide Ambulatory Care Centers
- Home Care Company
- 1,800 Full-Time Faculty
- 10,000 Employees

Our Continuing Quest for a COMPUTER BASED RECORD, and the ULTIMATE Clinical System

- **Network of specialized systems need better integration:**
  - **Administrative (ADT, registration, billing…)**
  - **Ancillary (Lab, Pharmacy, Radiology)**
  - **Specialty (Intensive Care, Oncology, Cardiology ……..)**
- **Integrated via HL7 and real-time interfaces**
- **Electronic Patient Record is a central element: collecting, and making accessible, data from many sources**

COMPUTERIZED PATIENT RECORD FUNCTIONALITY

- **Providing real-time online access to the record from any Hospital clinical site - inpatient nursing units, outpatient clinics (on campus and in other locations), and the emergency department**
- **Providing a longitudinal patient care database that is rich in its content and depth of information**
- **Using online order entry of patient care orders to eliminate transcription errors, provide intelligent alerts to prevent duplicate orders or drug-drug interactions, and to communicate real-time with ancillary systems - BUT WE'RE NOT THERE YET!**

Computerized Patient Record Functionality (continued)

- Providing interaction of the Pharmacy system with a third-party database to allow for drug/drug, food/drug, allergy/drug interactions, and to provide dose limit checking at the order entry point
- Providing real-time access to Radiology, EKG, EEG and other reports as they are prepared
- Supporting retrospective and prospective data analysis for research and identifying potential patient candidates for research studies

Computerized Patient Record

Functionality (continued)

- Providing tools to facilitate better documentation of care
- Coupling the clinical system with Web-based tools for reviewing published recommendations, monographs, and diagnostic/therapeutic reference material
- But operating at a remarkable disadvantage in the absence of universal Physician Order Entry

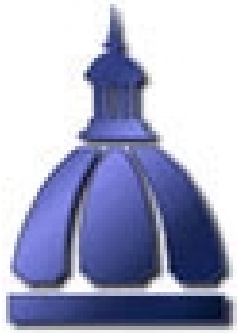
AVAILABILITY OF THE COMPUTERIZED PATIENT RECORD

- **Accessible at every JHH Nursing Unit**
- **In every exam room of outpatient facilities**
- **In every JHH physician's office**
- **State-wide primary care sites**
- **Also at other JHM affiliate facilities**
- **Select referring physician offices (web version; read only)**

CHALLENGES - Past, Current & Future

1. **Infrastructure:**
   - **Network**
   - **Training**
   - **Demand**
   - **Funding**
2. **Security - HIPAA**
3. **Heterogeneous Environment**
   - **Culture of Decentralization**
   - **Legacy Systems**
4. **Continuing Improvements/**

   New Developments
5. **Technology**
6. **"Help" System**



CRITICAL SUCCESS FACTORS

and Why

"It isn't about the Technology"

1. Collaboration of Technical Experts and Physicians
2. Leadership/Champions
3. Momentum/enthusiasm
4. "Thick Skin"
5. Openness, Flexibility, Willing to Listen

EPR - a Pragmatic View

- One element of an integrated system
- Is an aggregation of summary clinical content from many sources
- Is an “action point” for common clinical documentation tasks
- Not a complete “paperless” record
- Not a “do everything” system

Electronic Patient Record System (as of 1994)

- Contents
  - Laboratory Results
  - Radiology Reports, Discharge Summaries and Operative Notes
  - Patient Demographics and Visit History
- Interfaces
  - (HL7) Lab, Radiology, ADT, Outpatient Registration
  - Transcription
- Technologies
  - Data Storage (DB2 and VSAM)
  - Cobol “terminal” applications

Motivations

- Modern graphical interface
- Improved “document” processing
- Increased data “coverage”
  - Clinic Notes
  - Problems, Allergies/Adverse Reactions, Medications
- Increased future flexibility

Clinician Involvement

- Clinical Systems Advisory Committee
- Physician Development Advisors
- EPR Steering Committee
- EPR User's Group
- Individual Advocates and Champions

Key Transition Issue

- Infrastructure was not ready for a GUI

- Implications:
  - "old" and "new" applications would need to coexist for an extended period
  - existing data sources would need to serve both applications ("re-purpose" the data)

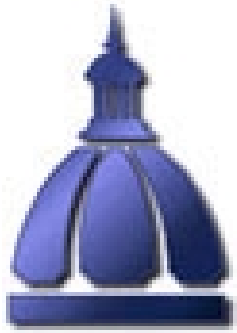
Architecture

A Web Application? Not ready in 1994 (Frames, Tables, Applets, Active Server Pages, JavaScript …..)

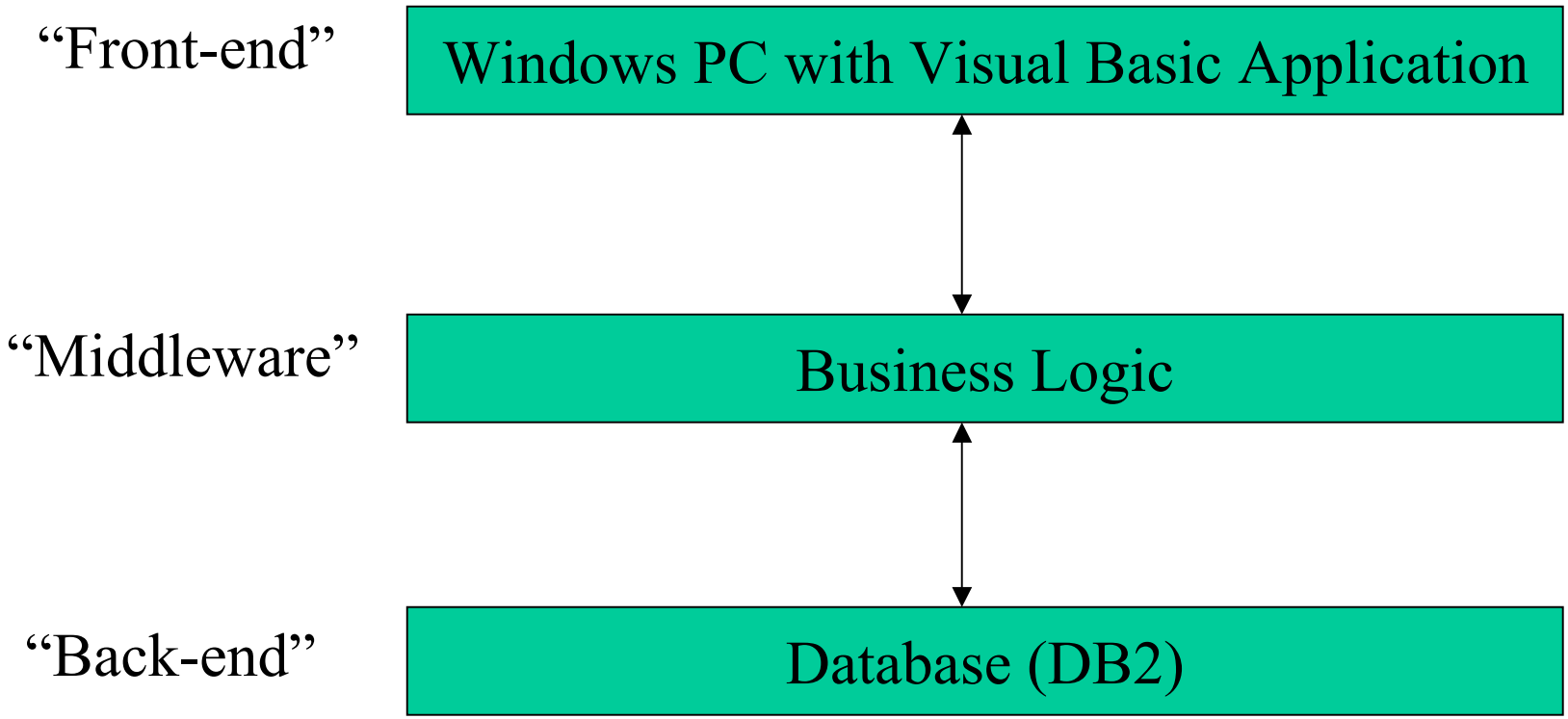
But already visible as "the future"

Whatever we built needed to be capable of supporting MULTIPLE "front-end" applications

A "Three Tier Architecture"



Three Tier Architecture



Deployment and Beyond

- Initial Deployment 1995 JHH, 1997 JHBMC
- Continuous Growth in Usage
- Continuous Growth in Data “coverage”
- Continuous Evolution of the User Interface
- Continuous Demand for More Functionality

Current Scale (JHH)

- 3,000,000 Patients
- 10,000,000 Visits
- 6,000,000 Documents
- 100,000,000 Lab Results
- 3000 users

System Evolution Topics

- Central Physician Directory; the world of the Referring Physician
- Web EPR
- Departmental Integration
- The Growing Cost of Transcription

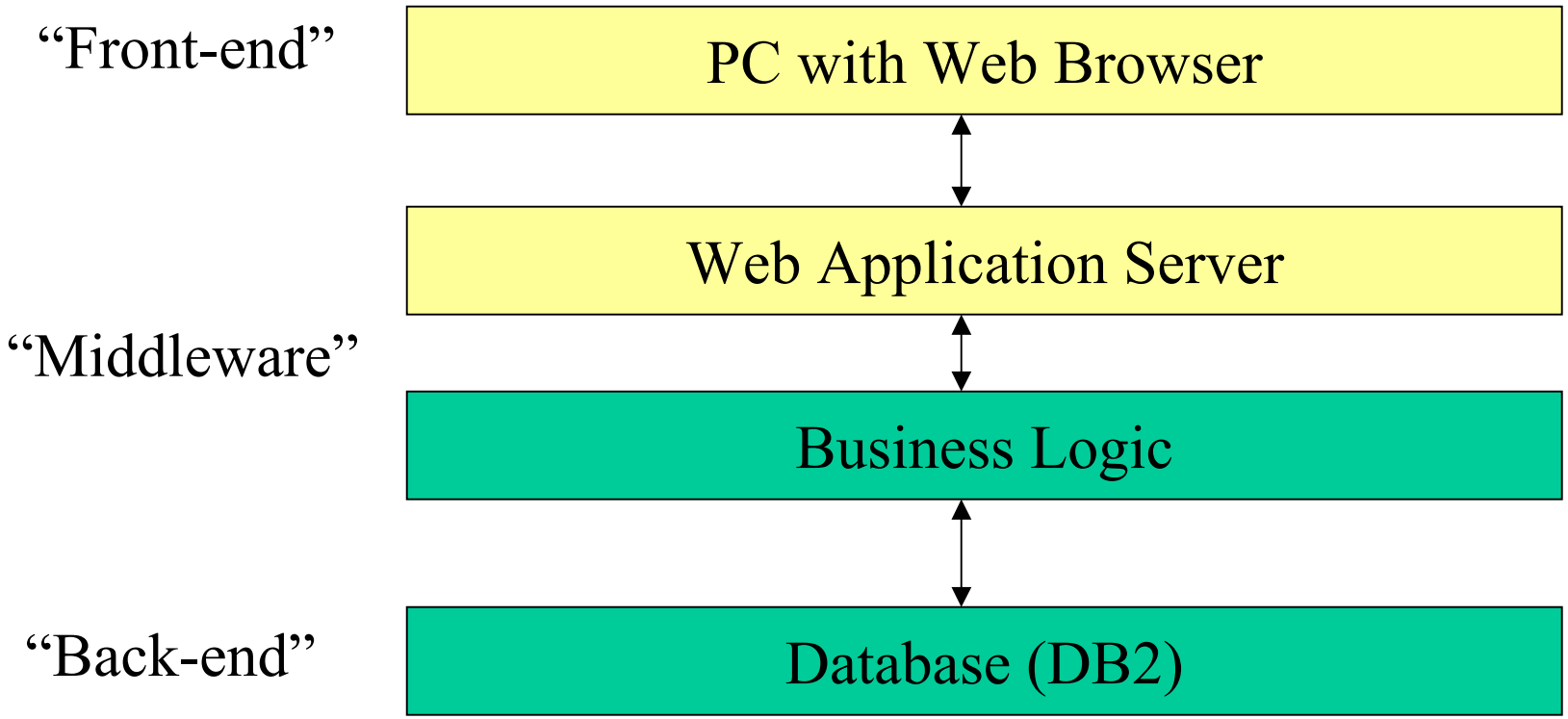
Central Physician Directory

- Managed Directory of Internal and Referring Physicians
- Integrated with ADT and OP registration systems (in the next release)
- Automated Distribution of Documents

Web EPR

- An alternative “read-only front-end”
- Constructed to provide an “off-site” view of the EPR
- Extended to Referring Physicians with “only their patients” view of EPR
- Has now gone International

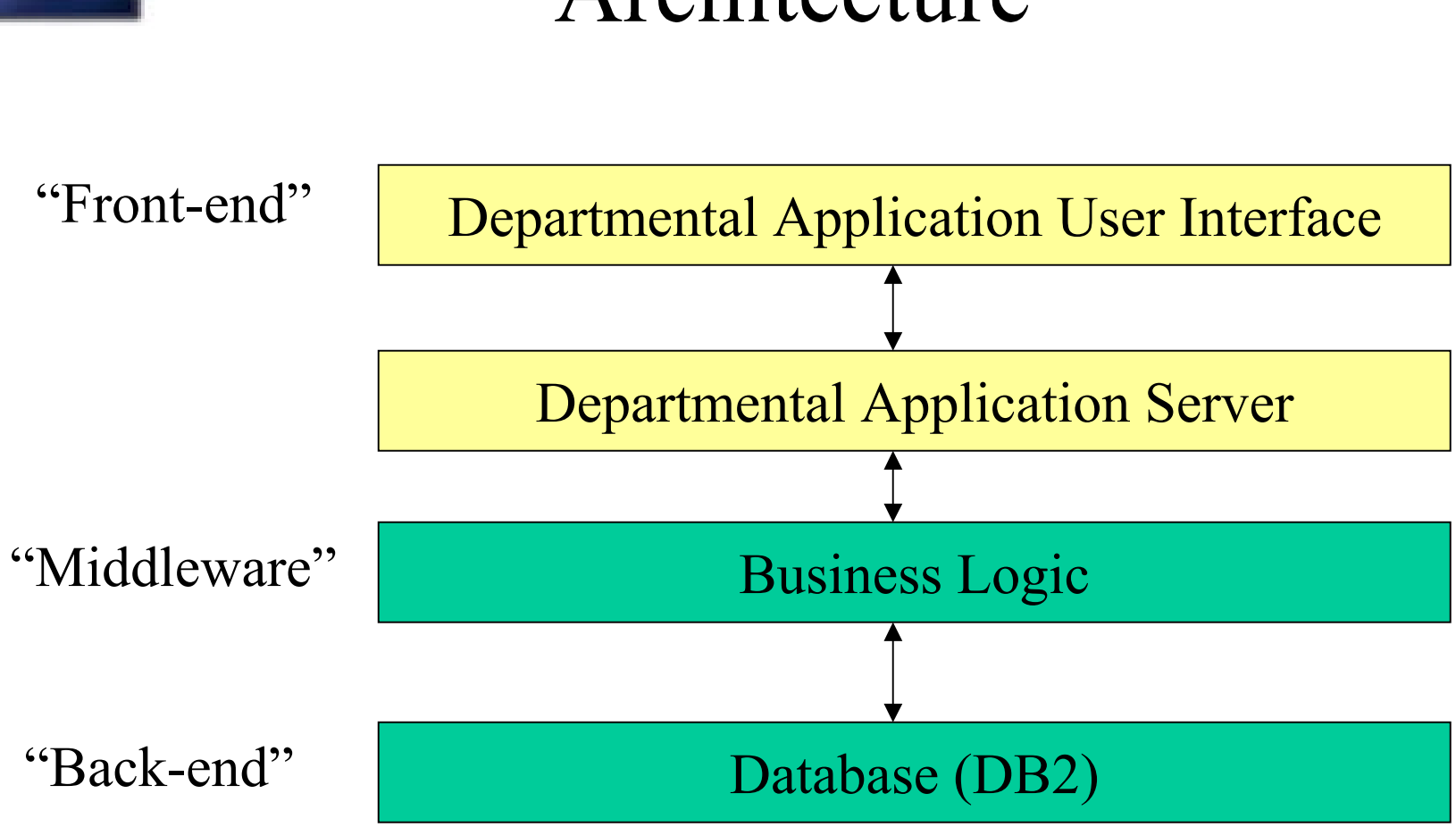
Web EPR Architecture



Departmental Integration

- Departmental systems reuse the “Business Logic Tier”
  - Laboratory Medicine, Oncology, Cardiology, Anesthesia/Surgery, Neurology, Cardiac Surgery
- Typical Uses
  - Patient ID verification, visit selection
  - Document retrieval and upload
  - Referring MD identification

Departmental Integration Architecture



Current Activity to Address Transcription Costs (and other needs)

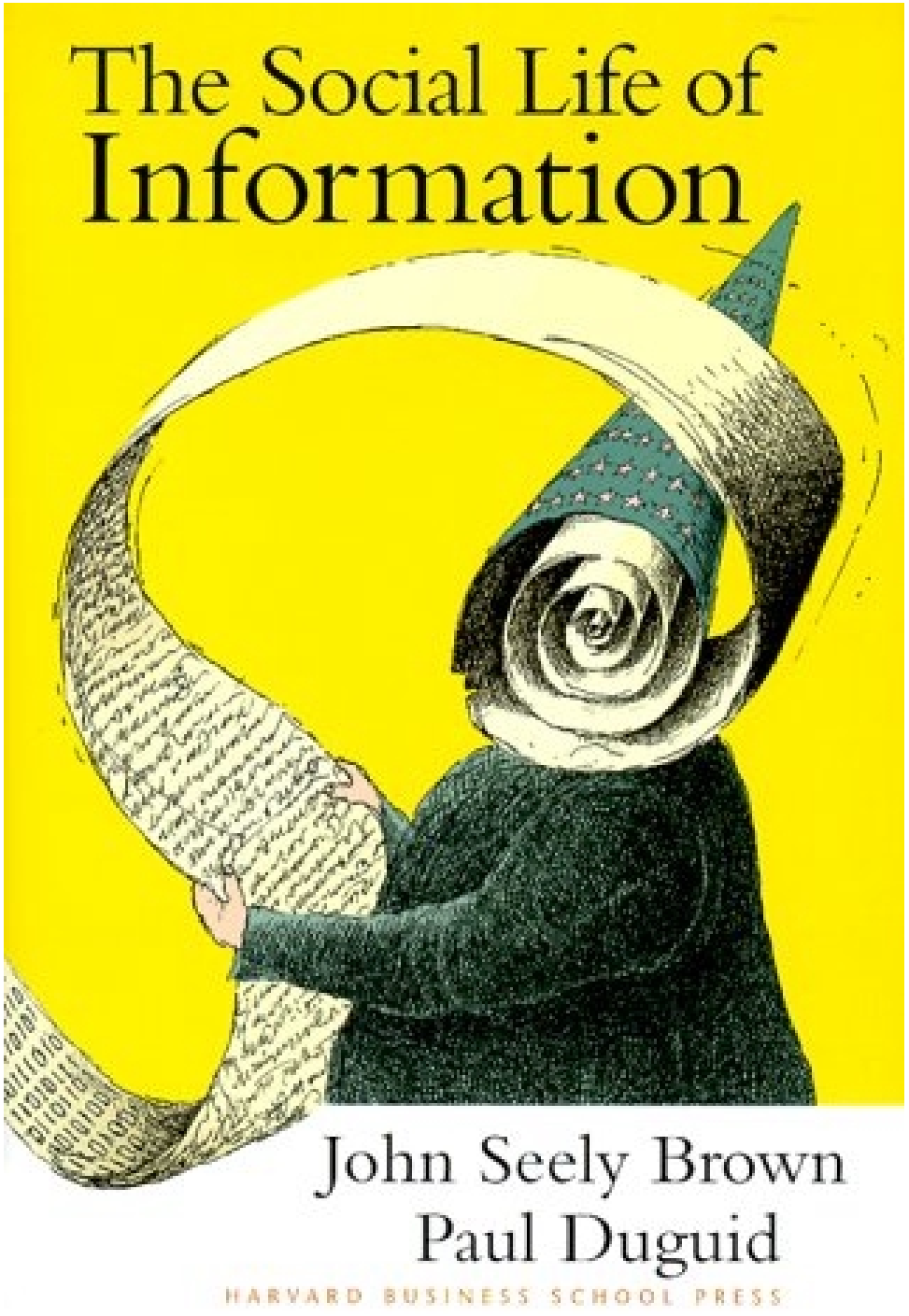
- Clictate (document builder)
- Revised “Problems, Allergies, Medications”
- Pharmacy Interface
- Radiology Images
- Health Maintenance Record

Future Activity

- Personalization by provider and context
- XML document orientation (HL7 Patient Record Architecture)
- Modular “departmental” extensions (one size never fits all)

Take Home Messages

- Direct Physician (All Users) Involvement is a “must”; Don’t Assume Anything
- Data has a life of its own, independent of any one application
- “Business Logic” must be directly accessible, for use wherever needed
- Information delivery mechanisms will continue to change dramatically


The Social Life of
Information
John Seely Brown
Paul Duguid
HARVARD BUSINESS SCHOOL PRESS

Johns Hopkins Medicine Electronic Patient Record

- EPR is in widespread use throughout Johns Hopkins with more than 2,000 members of the faculty and staff on the main campus are trained in the use of EPR.
- An additional 1,000 users on other sites use the system on an almost daily basis.
- EPR has allowed the quality of service in our medical record management department to be enhanced.

Johns Hopkins Medicine Electronic Patient Record

- Almost all notes generated by caregivers may be dictated, transcribed and automatically uploaded into EPR.
- Virtually no core documentation is needed in hard copy at the time of a patient encounter.
- EPR's clinical repository contains data for over 3.5 million patients, and includes over 60 million lab results, 2 million radiology reports, and 2 million encounter summaries.

Availability of the JHM Electronic Patient Record

- Accessible at every hospital nursing unit;
- In every exam room of outpatient facilities;
- In every physician's office;
- State-wide primary care sites;
- Also at other JHM affiliate facilities; and
- Select referring physician offices.

Some issues for attention: Incorporating the Internet in Electronic Medical Records

- Is it time to use the Internet to provide clinicians with remote access to clinical systems from their clinics, offices or homes?
- Is it time to use Internet technologies to help provide access to clinical information from multiple information systems instead of installing a stand-alone electronic records system? Or is it time to use Internet technologies to seamlessly present information from various stand-alone information systems, thereby creating a virtual electronic records system?

Incorporating the Internet in Electronic Medical Records

- Is it time to enable systems users to access electronic medical records via application service providers - software companies that maintain information systems and data at their sites and provide access to the systems via the Internet?
- Is it time to use the Internet to provide patients with access to their computerized, official medical records?

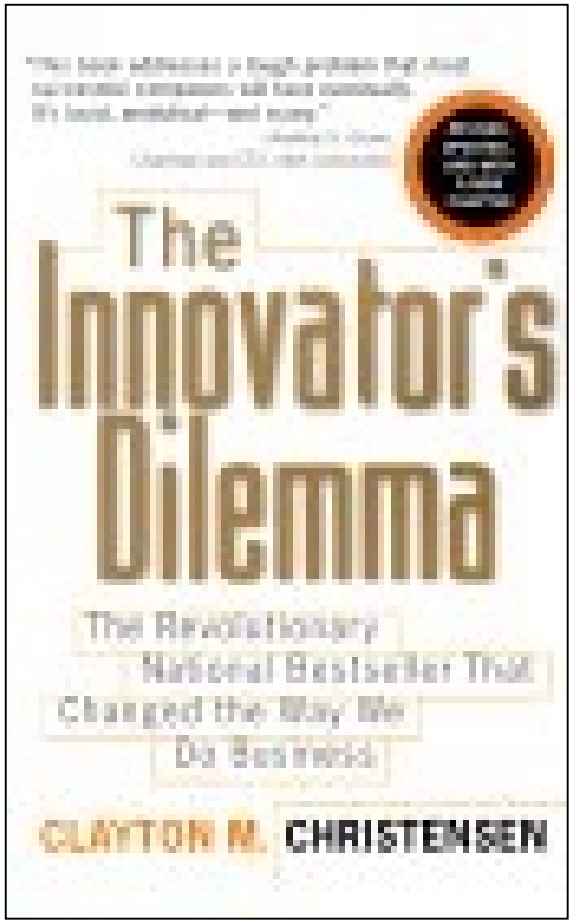
Internet & Electronic Medical Records: Not Necessarily a Perfect Fit

- **Security.** The difficulty inherent in putting in place security to verify who has access to medical records on the Internet is keeping some provider organizations at bay.
- **Availability.** The Internet is not always available 24 hours a day, 7 days a week. Such availability is needed for critical health care applications such as electronic medical records.
- **Quality of Service.** Enormous variations can exist in file download times - especially when trying to access image files or videos. This makes the Internet unsuitable for rapid transfer of medical images or video consulting.

So what did we learn from all of this…..

- Clayton Christensen said it best in his book The Innovator's Dilemma ….. "… the pace of progress that (markets) can absorb may be different from the progress offered by technology" and

- "…the capabilities of most organizations are far more context-specific than most managers are inclined to believe"

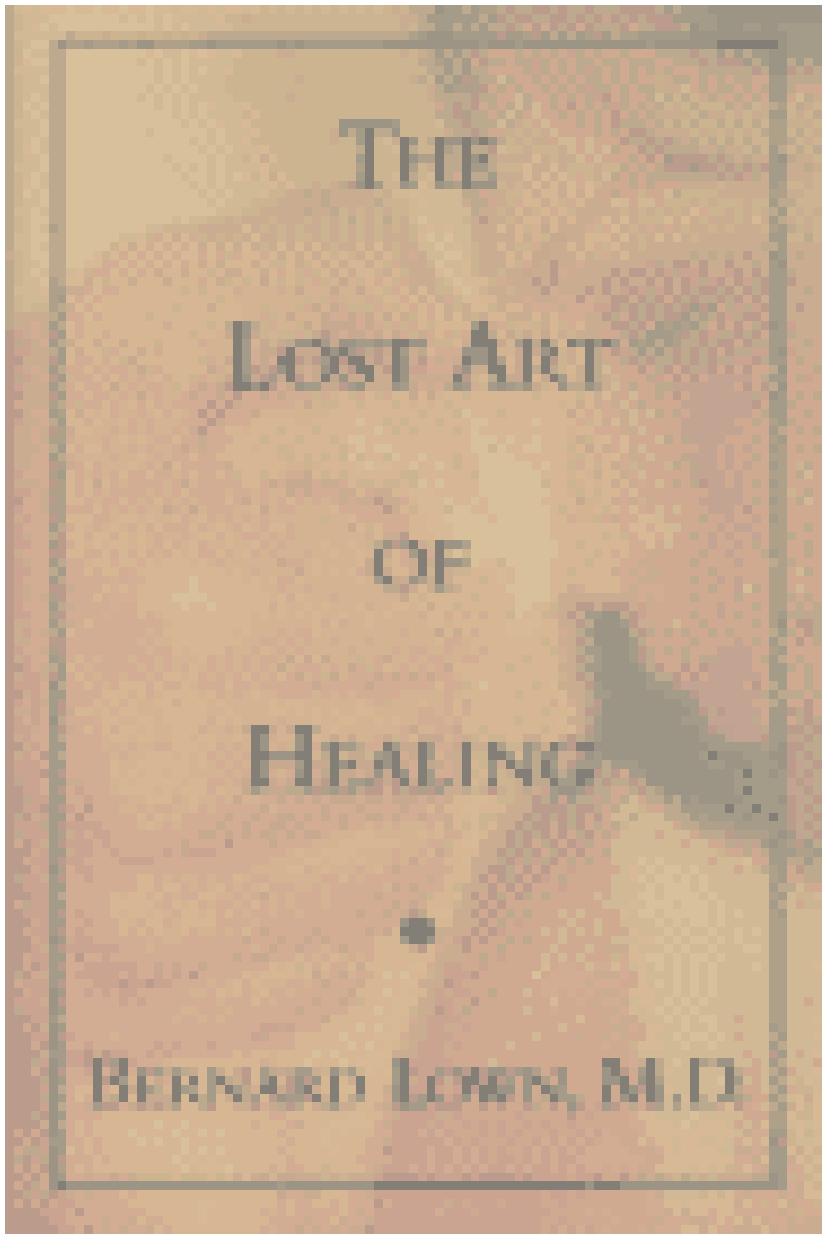


You ARE different !

- We all believe we are each different, but in fact you ARE different !
  - But perhaps you can relate to the summit that the AAMC recently held:
    - Breaking the Scientific Bottleneck - Clinical Research: A National Call to Action

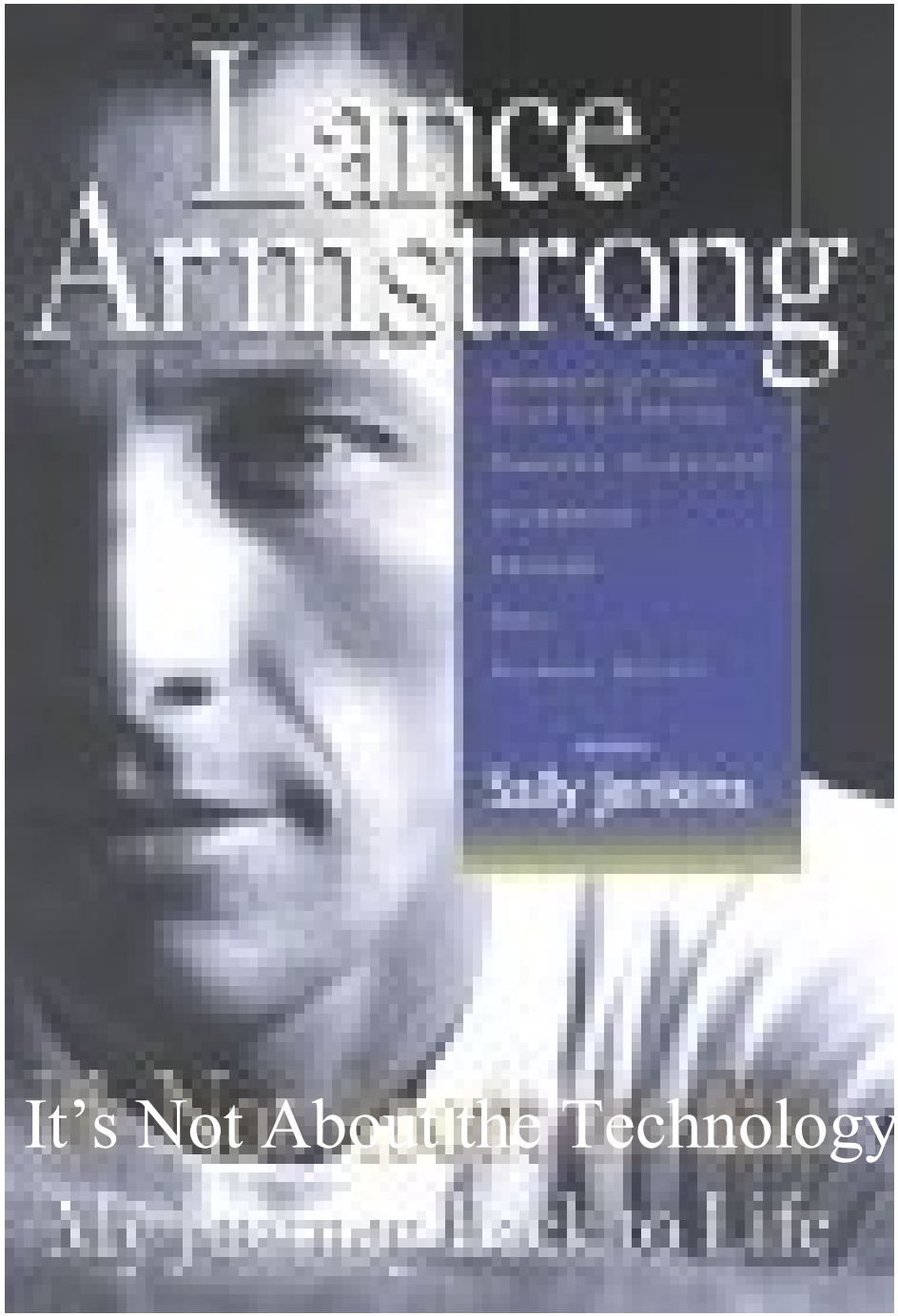
Attendees and the URL for the Summit

- Http://www.aamc.org/newsroom/clinres/
- Convened by the AAMC, the AMA, and Wake Forest University School of Medicine, and chaired by Dr. William H. Danforth, Chancellor Emeritus, Washington University in St. Louis



"At mid-centruy a doctor's image outshone nearly every other profession or calling. Yet it appears that with each new medical miracle, the image of physicians shrinks and grows more tarnishes. Doctors are held in lower repute than ever…"

"It's Not About the Technology"



“Do or Do Not, there is no try!”-- Yoda

“Trust your feelings”--
Ben (Obi-Wan) Kenobi

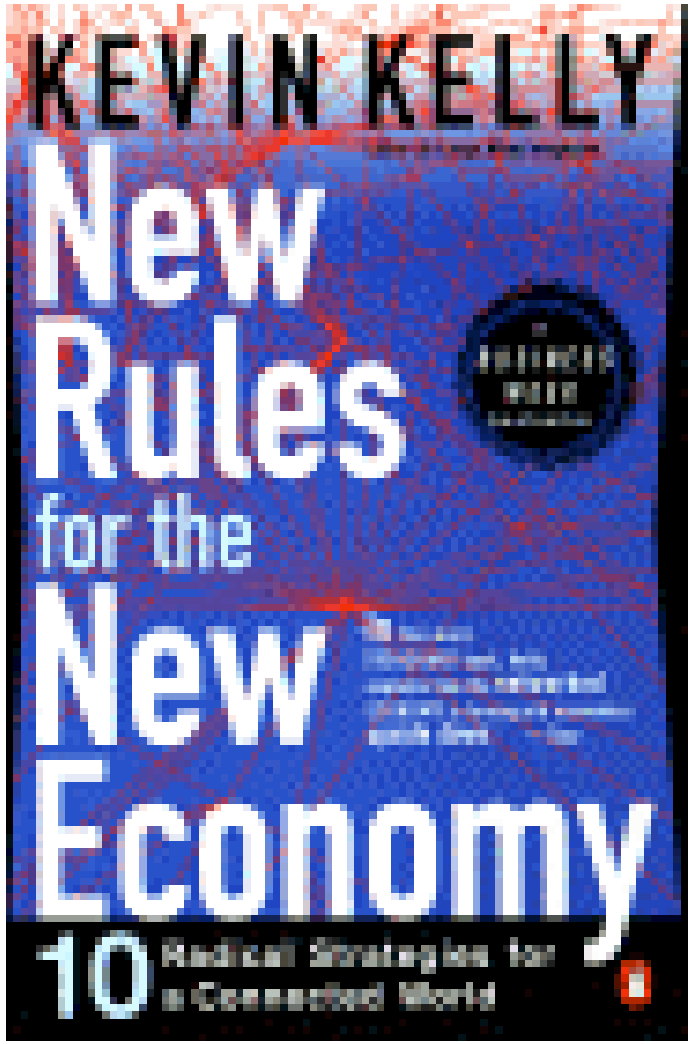
Because system implementations are political……..

"There is far more to be gained by pushing the boundaries of what can be done at the bottom, than by focusing on what can be done at the top"

“encourage turbulence; it becomes innovation”

“Ten Radical Strategies for a Connected World”

-- Kevin Kelly



“Information is the currency of democracy”
--Thomas Jefferson